THE AMERICAN
JOURNAL OF PHARMACY

APRIL, 1904.

A CHEMICAL STUDY OF THE SEED OF RHUS GLABRA.

BY G. B. FRANKFORTER AND A. W. MARTIN.

The Anacardiaceæ or Cashew family contains about 450 species. Most of these occur in the tropical regions. The genus Rhus or sumac represents about the only members of the order occurring in Northern United States. Of the 120 species of Rhus, about 20 are considered as having medicinal or commercial value. An infusion of the leaves, the bark and the pubescence of the seed of several species, is used in both the dyeing and the tanning industries. Sixteen species are mentioned in the United States Dispensatory.

Rhus glabra, the species under discussion, is one of the most common in the Northern States. It has been studied several times. Watson made an examination of the bark of the root, recording the following constituents: gum, resin, caoutchouc, starch, albumin, gallic and tannic acids and coloring matter. (AMER. JOUR. OF PHARM., **25**, p. 194.) The amount of tannin in the leaves has been found to vary widely. Analyses of the leaves from the Northern States show an average of 16 per cent., while the leaves from the same species growing farther south contain as high as 25 per cent. An examination of the galls of the same species showed nearly 62 per cent. of tannin. (AMER. JOUR. OF PHARM., **62**, p. 564.)

The seed of the Rhus glabra has been mentioned; but, so far as could be ascertained, only the briefest preliminary examination has been made. Tannin has been recognized in the seed and malic acid in the pubescence. In addition to these constituents, fixed oil, a volatile oil and coloring matter have been mentioned.

Experimental Part.—The seed used in the following experiments was gathered about the 1st of September, after it had become fully matured and the husk had begun to dry. A large amount of seed was gathered and preserved in as near the condition it existed when gathered as possible.

Moisture.—The determination of moisture was made on the whole seed, which was found to be quite different from results obtained from the seed after it was ground. In both cases the husk was included.

Weight of seed, including husk	100 grammes.
Loss, after heating two hours at 105° C. to 110° C. . .	6.862 "
Per cent. of moisture	6.862

Ash.—The unusually high percentage of ash led to a somewhat extended examination as to the cause. The unhusked seed gave an average of 2.65 per cent. of inorganic matter. Upon examining the husk under the microscope, it was found that the pubescence of the husk had collected a large amount of dust. This was subsequently verified by an ash determination of the husk.

Acidity of the Seed.—A preliminary examination showed the presence of several acids. The complex nature of these acids led to a simple determination of the total acidity of the seed by means of sodium hydroxide. The acids were extracted by means of hot water. Two sets of experiments were made—one on the whole or unground seed and the other on the pulverized seed, the object being to locate the acids. It was found that the kernel was almost impervious to boiling water, so that any acid extracted from the whole seed would come largely at least from the husk.

Extract from 5 grammes of unground seed, including husk, required.	0.052 grammes NaOH.
Extract from 5 grammes of ground seed, including husk, required.	0.059 " "

These results were later verified when a satisfactory method of separating the husk from the seed was found. In fact, the husk seemed to contain practically all of the acid.

Extracts from the Whole Seed.—In order to determine the amount of extract material in the whole seed, it was pulverized and extracted with ether, alcohol and water in the order named.

50 grammes of seed gave 11.193 grammes of extract with ether, or	22.36 per cent.

50 grammes of seed gave 3·37 grammes of extract with alcohol, or . . . . . 6·74 per cent.
50 grammes of seed gave 2·38 grammes of extract with water, or . . . . . 4·76 "

An examination showed that these extracts were of complex nature. The extract obtained from the ether consisted chiefly of an oil of peculiar properties and a reddish solid substance. This solid substance, on precipitating from ether, appeared as a yellowish crystalline mass and gave tests for tannic acid. The alcoholic extract was a dark amorphous mass with a peculiar astringent and slightly acid taste. There was present a small amount of oily substance. The aqueous solution contained, in addition to the bitter principle, an appreciable quantity of acid.

The results of the above experiments, with other preliminary tests, showed that the husk was of unusual interest, besides having entirely different properties from the seed proper.

The separation of the husk from the seed was a difficult problem and up to the present experiments had not been successfully accomplished. It was found that by passing the whole seed through a carefully-adjusted pulp-mill, the husk could be completely removed from the seed without crushing the latter in the slightest degree. An exact determination gave the following proportion of the seed and husk:

Seed . . . . . 60·1 per cent.
Husk . . . . . 39·9 "

The Seed Proper—An examination of the husked seed showed quite different results, as will be seen from the following determinations:

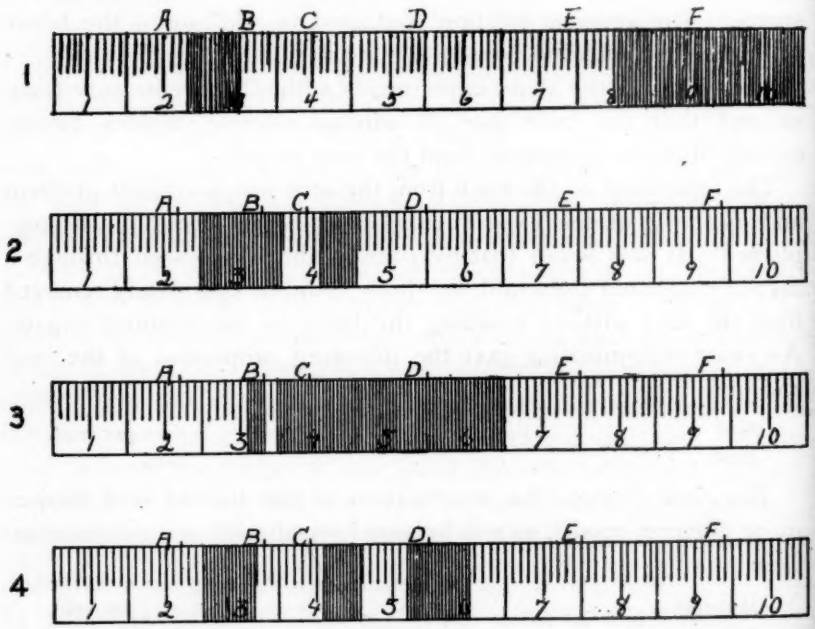
Moisture . . . . . 4·93 per cent.
Ash . . . . . 1·98 "

The acidity was reduced to a minimum, 5 grammes of the seed requiring only one-fourth of the amount of sodium hydroxide necessary to neutralize the same weight of unhusked seed.

Rhus Seed Oil.—In the first examination of the seed for oil, the whole or unhusked seed was used. The very complex nature of the oil obtained made it necessary to seek some method of obtaining a simpler substance. An examination of the seed and the husk separately, revealed the fact that the complex nature of the oil obtained from the whole seed came largely from the husk, and that the oil of the seed was a single comparatively pure substance.

This oil was obtained in considerable quantities by extracting the ground seed with ether. Five exact determinations were made giving an average of 9·1 per cent. of oil.

The oil obtained is a light yellow mobile liquid with a peculiar odor and a pleasant taste. At — 18° C. it becomes viscous and at — 24° C. it is a solid. The specific gravity at 20° C. is 0·9203 and at 0°, 0 9312. The oil is soluble in nearly all of the organic solvents, including ether, chloroform, benzene, carbon disulphide and acetone. The index of refraction at 0° is 1·48821 and at 15°, 1·48228. It is optically inactive.



(1) Rhus oil; (2) Wheat oil; (3) Corn oil; (4) Linseed oil.

The absorption spectrum is peculiar. Even with comparatively thin layers, 4 to 6 m.m., the violet rays of the continuous spectrum are entirely cut off and in the red portion about the position of the lithium band there appears a perfectly black band. The above is a simple diagram as compared with linseed, corn and wheat oils.

Drying Properties of Rhus Oil.—Rhus oil is essentially a non-drying oil. In quantities, the loss on exposure to the air is very small, but when a thin film of oil is exposed the increase in weight is such

as would almost place it in the semi-drying group. The following table is a comparison of rhus oil with wheat and linseed oils. The increase in weight is given in parts per hundred, the time extending over a period of thirty days:

Number of days	5	10	15	20	25	30
Rhus oil, gain	0.005	0.027	0.054	0.071	0.104	0.142
Wheat oil "	0.037	0.077	0.15	0.24	0.30	0.37
Linseed oil "	0.037	0.13	0.28	1.74	4.82	7.55

Saponification Value.—The determination of the saponification value was made by the common method of saponifying a known quantity of the pure oil with standard alcoholic potassium hydroxide, calculations being made in milligrams of hydroxide per gramme of the oil. Three determinations gave the following:

I. 2.0005 grammes of oil required . . 0.39086 gramme of potassium hydroxide
II. 1.8923 " " " " . . 0.26817 " " " "
III. 1.9096 " " " " . . 0.3707 " " " "

	I.	II.	III.
Calculated in milligrams of KOH per gramme of oil	195.3	194.9	194.7

These values indicate a non-drying oil, the range of which is from 190 to 200.

Iodine Value.—The iodine value was determined by the Hübl method. The time required for the complete absorption of the iodine was much greater than in the common oil. Three determinations gave the following:

I. 0.1611 gramme of oil absorbed . . . . 0.014155 gramme of iodine
II. .1668 " " " " . . . . 0.014339 " " "
III. .1737 " " " " . . . . 0.014848 " " "

	I.	II.	III.
Per cent. of iodine absorbed	87.86	85.96	86.4

Determination of Glycerol.—Glycerol was determined by the well-known method of Benedict-Zsigmondy, which consists in saponifying the oil and oxidizing the glycerol by means of alkaline potassium permanganate to oxalic acid according to the simple reaction,

$$C_3H_8O_3 + 3O_2 = C_2H_2O_4 + CO_2 + 3H_2O.$$

The oxalic acid was then determined as calcium oxalate and the per cent. of glycerol calculated.

I. 2.6859 grammes of oil gave . . . . . 0.2493 gramme of glycerol
II. 2.5314 " " " " . . . . . 0.2114 " " "

	I.	II.
Calculated for $C_3H_8O_3$	9.28	8.35

Unsaponifiable Matter.—The determination of unsaponifiable matter was made by a method used for the determination of the cholesterols in oil, namely, the complete saponification of the oil, drying and extracting the unsaponifiable matter by means of ether. Two determinations gave an average of ·696 per cent. of substance. By repeating the process on a large scale a considerale quantity of substance was obtained. A chemical study of the substance is in progress. The work done so far would indicate that the substance belongs to the cholesterols, being a monatomic alcohol. From the analyses, it would appear that the molecule is larger than that of the cholesterols, though belonging to the same class.

The Examination of the Husk.—The husk and the pubescence were removed from the seed by the method already mentioned and examined. The material was of a reddish color, the coloring matter being soluble in ether, alcohol and water. It has a slightly acid and a peculiar astringent taste. These solutions gave strong tests for tannic acid. By shaking out the dried aqueous extract with ether, a large amount of impure tannic acid was obtained. This was subsequently purified and examined.

On evaporating the aqueous extract to a thick syrup and allowing to stand several days, a reddish granular mass appeared in the bottom of the dish. This was removed, washed several times with water and recrystallized. The substance then appeared as small white cubical crystals, which were identified as acid calcium malate. They had a melting point of 81° C. The filtrate was found to contain practically all of the tannic acid, but there seemed to be no free malic acid, as reported by Reinsch. (*Zeitschrift f. Chemie*, 1886, p. 221.)

From the aqueous extract, which represented exactly one-quarter of the weight of the husk, the tannic acid and the acid calcium malate were determined. The results were as follows:

Tannic acid	7·32 per cent.
Acid calcium malate	1·35 "

Rhus Husk Oil.—The husk, which had been extracted with water, was dried and extracted with ether. The substance remaining after the evaporation of the ether, appeared as a black oil. At the ordinary temperature, it was a semi-solid. An average of several determinations gave 8·5 per cent. of oil.

An examination of the oil indicated that it was quite different in

many respects from the oil which occurs in the seed. Its specific gravity was taken at 20° C. as a semi-solid and at 35° C. as a liquid. The former was 0·9412 and the latter was 0·933. Like the Rhus seed-oil, it is non-drying, but a single test indicated that it had more of the drying properties than the seed-oil. This may have been due to the fact that more foreign matter existed in this than in the seed-oil. This statement is probable, inasmuch as the iodine values in the two oils are about the same. Three iodine determinations gave the following:

I. ·1816 gramme of husk-oil absorbed . ·01584 gramme of iodine
II. ·1560 " " " . . ·01364 " "
III. ·1638 " " " . . ·01422 " "

	I.	II.	III.
Per cent. of iodine	87·1	87·4	86·7 ; average, 87·2

Two determinations of saponification value gave the following results:

I. 1·5044 grammes of husk-oil required, ·2699 gramme of potassium hydroxide
II. 1·6205 " " " ·2917 " " " "

	I.	II.
Calculated in milligrammes per gramme of KOH,	179·3	180·1 ; average, 179·7

The chief difference between these two oils is due to unsaponifiable matter, to an easily oxidizable substance and to the fact that the husk oil contains two distinct oils. It was found that by treating with acetone, about 80 per cent. of the oil dissolved, and by evaporating off the acetone was obtained as a light-yellow liquid. The insoluble substance appeared as a black semi-solid. The light-yellow oil was compared with the seed-oil, but was found to differ in various ways. The black oil and the unsaponifiable substance present in it are under examination at the present time.

The Cholesterols.—The cholesterols are among the most mysterious compounds with which the plant and physiological chemist has to deal. Little more can be said of them than the simple fact that they are complex mon-atomic alcohols of aromatic nature, and that they are widely distributed in both the plant and animal world. There is, at the present time, no good reason for their existence, and yet as plant and animal analyses progress, the more widely they appear to be distributed. It was formerly supposed that common cholesterol was almost or entirely of animal origin, and that phytosterol, an isomeric form, was of vegetable. Such an idea is no longer

tenable for cholesterol, as well as its iso- and para-form (*Jour. Am. Chem. Soc.*, 21, p. 766), has been isolated in the vegetable oils.

The complexity of the molecule, the difficulty in obtaining them in quantities and the inactivity toward other substances, are some of the causes of our meagre knowledge of the cholesterols. From examinations of a number of vegetable and animal oils, there seems little doubt but these four or five forms represent only a small portion of the group.

Both of the substances obtained from the above oils, according to analyses, are mon-atomic alcohols, but with a higher molecular weight than cholesterol. The unsaponifiable substance above obtained is at present under examination. The purified substance obtained after repeated crystallizations had a melting point of 63·5° C. to 64° C. Like cholesterol, it does not readily react with other reagents, but enough has been done to indicate that both of these substances, although of a more complex nature, belong to the cholesterol group.

CHEMICAL LABORATORY, UNIVERSITY OF MINNESOTA.

AROMATIC ELIXIR.

BY WILBUR L. SCOVILLE.

Ten years ago the interests of pharmacists in elixirs was centred mainly in the question, What is the best flavor for an elixir for general use? Our drug journals offered prizes for elixir formulas, and the formulas offered differed mostly in the character of the flavor.

To-day an orange flavor is generally adopted as, all things considered, the best adapted for a basal elixir. No flavor blends so well with all kinds of medicaments, or covers disagreeable tastes to better advantage. Seldom is there heard a demand for any other fundamental flavor.

As a type of an orange elixir, the aromatic elixir of the Pharmacopœia stands at the head of published formulas. It is a well-blended mixture which contains just enough aromatics to bring up the softer orange. But as compared with some commercial elixirs it lacks power and freshness. Many pharmacists seek to supply this lack by the addition of other aromatic oils in liberal quantity, and thus lose the chief characteristic of the original flavor. These highly aromatic combinations are not wholly satisfactory, since they

often fail to cover well the taste of disagreeable substances. A strongly flavored elixir will not be as generally successful in concealing unpleasant tastes as a milder and softer quality that appears bright and pronounced. What is now desired is an orange elixir that will have the fresh and bright qualities of fresh oranges, with just sufficient aromatics to bring up the flavor without making it spicy.

The first failing in the official formula lies in the unreliability of the orange and lemon oils in common use. That these are very much adulterated is well known, and when to this is added an extreme sensitiveness to air which causes a destruction of the flavor, even in the elixir itself, the difficulty of securing the desired results are the more marked. A pure oil changes much less rapidly and markedly than an impure in the elixir.

The best means of securing an undoubtedly pure oil is to use the fresh fruits. Oranges and lemons can be obtained in all parts of the country at reasonable prices, in their season, and for the pharmacist a tincture of the fresh peel is the best means of obtaining the flavor. This plan is already followed in many pharmacies with much satisfaction. The usual method is to grate off the outer yellow layer of the peel, in which are the oil cells, and macerate the gratings in alcohol for an indefinite time. In the writer's experience, it is impossible to grate the peel without tearing off some of the inner, white layer, which contains the bitter principle, and which spoils the softer orange flavor. The exercise of care, with some sacrifice of the oil cells to be on the safe side, will reduce this danger to a minimum, and produce a tincture which will be very satisfactory. But if the peel be shaved instead of grated, taking care to cut only through the oil cells, and not include any of the white portion, the results are more satisfactory in several particulars. Shaving the peel can be accomplished more quickly and easily than grating, if the following plan be followed: The fruit is peeled, and the peel cut into strips not exceeding half an inch in width. These are laid in turn upon a board or other flat surface, held with the fingers of one hand, and the yellow layer can be shaved off at almost a stroke, with a sharp knife. When one has become accustomed to the operation it can be done rapidly, and with no danger of getting the bitter flavor. If a large number of oranges are to be treated at a time, there is a machine in the market which is not expensive and is

operated by hand, and which will shave off the peel from a box of oranges or lemons, in any desired thickness, at the rate of about a box an hour.

Furthermore, a tincture made from the cut peel seldom separates oil globules on standing, while one made from grated peel always does. Shaving the peel thus has a three-fold advantage: in ease and rapidity of operation, in greater security of flavor, and in a more permanent tincture.

To secure uniform results the strength of the tincture should be definite. The shaved portions of the peel are weighed, and 2 c.c. of alcohol are poured over them, in a wide-mouthed bottle, for each gramme of peel. After macerating forty-eight hours, the liquid is drained off through a filter, and the peel rinsed well with just sufficient alcohol to obtain a 50 per cent. tincture through the filter. A tincture so made will keep without change of flavor many months, and produce superior results in elixirs and other uses.

But while the use of tinctures of fresh fruits will improve the elixir, there is still a lack of vigor and freshness in the flavor. Flavors, like perfumes, need to be developed and strengthened to produce the best results.

Wine is the agent needed in this case. What musk is to a perfume, so will wine be to our elixir. A moderate amount will develop and brighten the orange flavor without imparting a vinous quality. Twelve and a half per cent. of wine in the elixir will bring out the orange and freshen its qualities without the wine being itself noticeable. If more than this be added the wine becomes prominent and the orange is reduced.

Then comes the question of the quality and kind of wine to be preferred.

Through the kindness of Messrs. Duroy and Haines, I have been enabled to compare the effects of ten different varieties of wines on this elixir. The wines tried were a port, malaga and claret of the red wines, and muscatel, tokay, angelica, sweet and dry catawba, two qualities of sherry and a "non-sparkling" champagne.

These were all used in the same proportions, and with the same tinctures of orange and lemon, and have been compared repeatedly during the past three to four months.

There is first a notable difference between the light and the heavy wines in the elixirs. The light wines blend perfectly with the

orange, and lose their individuality, while brightening the elixir. The heavy wines impart a heavy quality to the elixir which is foreign to an orange, though the wines themselves are not prominent.

My own preference is as follows: First, the muscatel, and this preference has been shared by most of the friends whom I have asked to make comparison. Next, the tokay, catawba (no real difference between the sweet and dry varieties) and angelica. These four are difficult to choose between, the preference depending largely upon the order in which they are examined. In fact, they are all a close second to the muscatel, and an elixir made with any one of these five light wines is satisfactory.

The sherry and "champagne" are less satisfactory. They do not blend as well, and they impart the heavier quality. If the two qualities of sherry tried can be taken as a criterion, the quality of wine used is secondary to the variety, so far as securing a bright and smooth flavor is concerned. The orange softens the rawness of a new wine, and the quality is less noticeable in the blend.

The red wines would not be chosen unless a colored elixir is desired. Like the sherry, they impart a heavy flavor and do not blend perfectly. The malaga blends the best of the three, but its color is not as good, having a marked brownish tinge. Claret produces a brilliant red elixir, but its flavor is not good. It is the poorest of the whole list in this regard. Port is fairly satisfactory in both color and flavor. But many would prefer to make the elixir with a white wine and color it to suit.

An elixir made with tinctures of the fresh fruits will, without wine, have a yellow or straw-tint, and the addition of the whitest wine (which is never white or colorless) will, of course, deepen the shade, making an amber or straw-colored elixir. Color is not of itself objectionable so long as it is fairly uniform.

The following formula will produce an elixir corresponding to the official aromatic elixir in character and strength, but improved in vigor and delicacy:

Tincture of fresh orange peel, 50 per cent.	15 c.c.
Tincture of fresh lemon peel, 50 per cent.	3 c.c.
Oil of coriander	0·25 c.c.
White wine	125 c.c.
Deodorized alcohol	230 c.c.
Syrup	375 c.c.
Distilled water, sufficient to make	1,000 c.c.

Dissolve the tinctures and oil in the alcohol, add the wine and then the syrup. Then add gradually, with agitation, enough distilled water to make 1,000 c.c. of mixture. Diffuse 10 grammes of purified talcum through the liquid, and shake it occasionally during four to seven days; then filter, returning the first portions to the filter until it comes through clear.

The cost of this elixir will be but slightly greater than the present official formula. In a number of trials, six oranges of fair size, such as are usually sold for table use, have made 100 to 120 c.c. of tincture. Six lemons will average to give 75 to 100 c.c. of tincture. Thus, three average oranges and one lemon will suffice for a gallon of elixir, so far as the fruit is concerned. The wine replaces a part of the alcohol, and the additional cost of this is small, while the advantage is great. And above all, an elixir is obtained which is really redolent of orange, and in which the average person will suspect nothing foreign.

JAMES SMITHSON.[1]

By William B. Marshall.

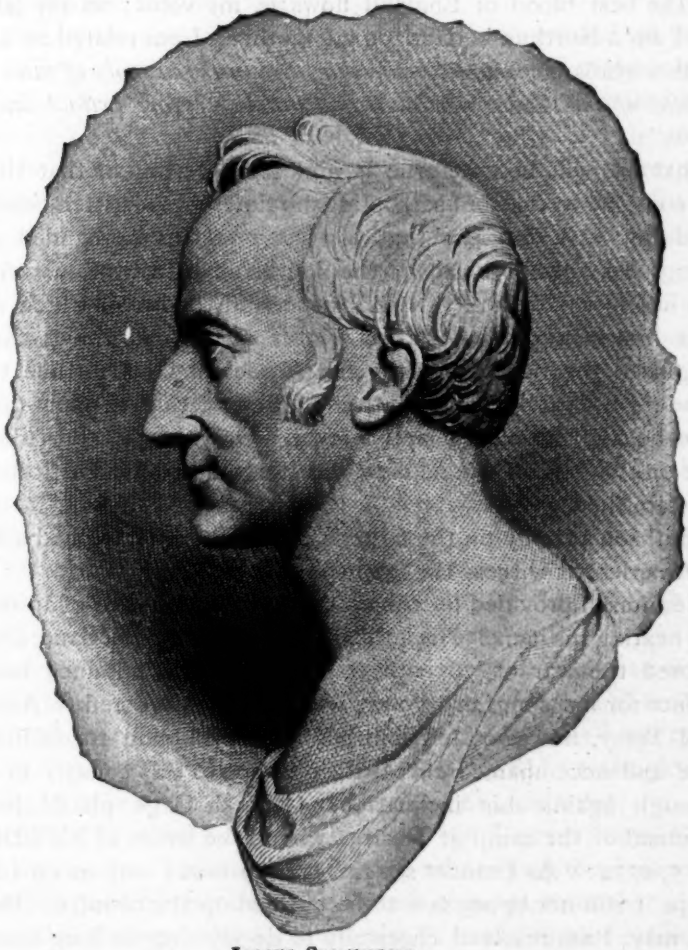
James Smithson, the founder of the Smithsonian Institution, was an Englishman, born in 1765. Until about the age of thirty-seven he was known by the name of James Lewis Macie (Macie being his mother's name), but later he obtained authority to change his name to Smithson. The exact date of the change is not known, but it seems to have been made at some time between 1794 and 1802. In the will of his half-sister, Dorothy Percy, dated 1794, he was designated as Macie. His second paper before the Royal Society was read November 18, 1802, and was published in the *Philosophical Transactions* under the title "A Chemical Analysis of some Calamines," by James Smithson, Esquire.

He was a natural son of the first Duke of Northumberland, formerly Hugh Smithson, who, upon the death of his grandfather, in 1729, succeeded to a baronetcy and became Sir Hugh Smithson. In 1749 Sir Hugh married Elizabeth Percy, and, later, upon becom-

[1] This sketch is founded upon, and largely quotes from, a paper by Samuel Pierpont Longley on "James Smithson," published as part of "The Smithsonian Institution, 1846–1896. The History of its First Half Century. Edited by G. Brown Goode."

ing Duke of Northumberland, he took the name of Percy by authority of an act of Parliament. He attained the peerage not through inheritance but because of his own abilities.

At the time of his birth James Smithson's mother was Elizabeth



JAMES SMITHSON.

Hungerford Keate Macie, widow of James Macie, a country gentleman living at Weston, near Bath, England. Mrs. Macie was a cousin of Elizabeth Percy, the wife of the Duke of Northumberland. She was a grandniece of Charles, Duke of Somerset, through whom she was descended from Henry the Seventh. According to an

unverified story, Mrs. Macie had sought a divorce from her husband in the hope that she might wed the Duke of Northumberland, but Macie prevented.

Concerning his parentage Smithson himself wrote:

"The best blood of England flows in my veins; on my father's side I am a Northumberland, on my mother's I am related to kings; but this avails me not, *my name shall live in the memory of man when the titles of the Northumberlands and the Percys are extinct and forgotten.*"

That this will become true is almost as certain as that the sun will continue to rise and set, but at the time it was written Smithson could not have foreseen that his name was to be handed down through the ages by means of the Smithsonian Institution. At the time he must have had in mind some high endeavor which would make him lastingly famous. A glance at his will shows that he recognized the ties of kinship and bequeathed his fortune to his nephew's use for life, and to the children of that nephew (should there be any) absolutely and forever. Only in case of failure of issue on the part of the nephew was the Smithsonian Institution to be established.

Smithson's family on the father's side seems to have had a liking for America, as witness the following:

He himself provided for the establishing in America of an institution bearing his name. His father, Duke of Northumberland, actively opposed the war of '76 with the colonies, and obtained leave of absence for his son, Lord Percy, who had been ordered to America. Lord Percy, however, felt himself in duty bound to decline the leave and accompanied the British troops to this country in 1774, although against his inclination. General Gage placed him in command of the camp at Boston, whence he wrote to his father on July 5, 1774: "As I cannot say this is a business I very much admire, I hope it will not be my fate to be ordered up the country. Be that as it may, I am resolved cheerfully to do my duty as long as ever I continue in the service. If I do not acquire any degree of reputation in it, it will be my misfortune, but shall never be my fault."

It was his fate to be ordered up country, as he was sent to cover the retreat of the troops which had been on the expedition to Concord and which had the famous unpleasantness with the colonists at Lexington, April 19, 1775. At the time he wrote to his father: "I

had the happiness of saving them from inevitable destruction, and arriving with them at Charleston, opposite Boston, at 8 o'clock last night; not, however, without the loss of a great many, having been under an incessant fire for fifteen miles. The rebels, however, suffered much more than the king's troops."

In 1782, at the age of seventeen, Smithson matriculated at Pembroke College, Oxford. Not much is known about his student days, except that he was noted for diligence and good scholarship, and that he was deeply interested in chemistry and mineralogy, in which studies he was the best student in his class. In 1784, he made a geological tour through Oban, Staffa and the western isles, with De St. Fond, "the celebrated philosopher," and the Italian count, Andrioni, in which they studied mining and manufacturing processes. Most of his vacations were devoted to excursions for collecting minerals and ores, which it was his favorite occupation to analyze.

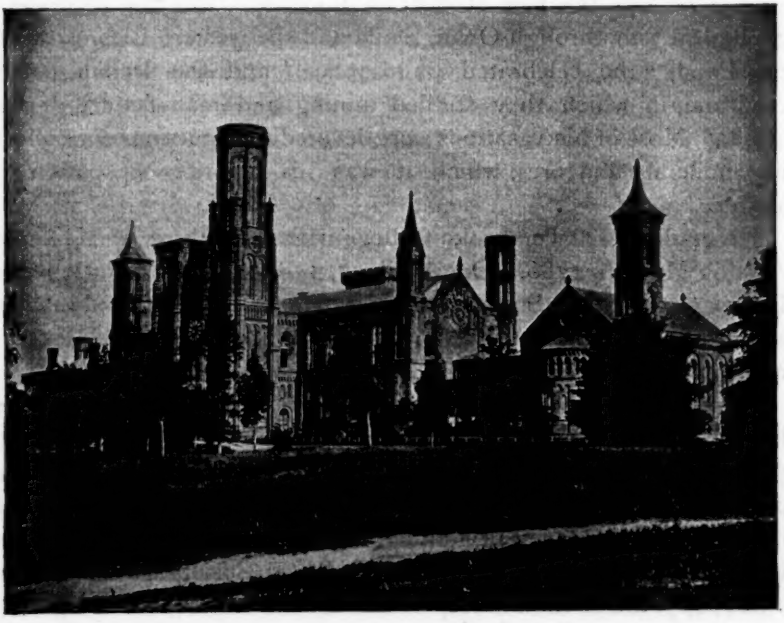
He graduated at Pembroke College with the degree of Master of Arts on May 26, 1786. On April 27, 1787, he was admitted as a Fellow of the Royal Society, before which, in 1791, he read his first scientific paper, entitled "An Account of Some Chemical Experiments on Tabasheer."

Not much is known of Smithson's after-career. In his later days, he resided in Paris, and was the victim of ill health. That he devoted much time to chemical investigations is shown by the published papers of which he was the author. His published writings were twenty-seven in number, of which eight were published in the *Philosophical Transactions* of the Royal Society between 1791 and 1807; one in the *Philosophical Magazine* in 1807; and eighteen in *Thomson's Annals of Philosophy*, between 1819 and 1825.

Prof. Frank W. Clarke, chief chemist of the United States Geological Survey, has placed the following estimate on these papers:

"The most notable feature of Smithson's writings, from the standpoint of the modern analytical chemist, is in the success obtained with the most primitive and unsatisfactory appliances. In Smithson's day, chemical apparatus was undeveloped, and instruments were improvised from such materials as lay readiest to hand. With such instruments, and with crude reagents, Smithson obtained analytical results of the most creditable character, and enlarged our knowledge of many mineral species. In his time, the native carbon-

ate and silicate of zinc were confounded as one species under the name 'calamine;' but his researches distinguish between the two minerals, which are now known as Smithsonite and calamine, respectively. To theory, Smithson contributed little, if anything; but, from a theoretical point of view, the tone of the writings is singularly modern. His work was mostly done before Dalton had announced the atomic theory; and yet Smithson saw clearly that a law of definite proportions must exist, although he did not attempt to



Smithsonian Institution.

account for it. His ability as a reasoner is best shown in his paper upon the Kirkdale bone cave, which Penn had sought to interpret by reference to the Noachian deluge. A clearer and more complete demolition of Penn's views could hardly be written to-day. Smithson was gentle with his adversary, but none the less thorough for all his moderation. He is not to be classed among the leaders of scientific thought; but his ability and the usefulness of his contributions to knowledge cannot be doubted."

His published papers were as follows:

IN THE PHILOSOPHICAL TRANSACTIONS.

"An Account of Some Chemical Experiments on Tabasheer." (Vol. lxxxi, part ii, p. 368, 1791.)

"A Chemical Analysis of Some Calamines." (Vol. xciii, p. 12, 1802.)

"An Account of a Discovery of Native Minium." (Vol. xcvi, part i, p. 267, 1806.)

"On the Composition of the Compound Sulphuret from Hull Boys, and an Account of its Crystals." (Vol. xcviii, p. 55, 1808.)

"On the Composition of Zeolite." (Vol. ci, p. 171, 1811.)

"On a Substance from the Elm Tree: Called Ulmin." (Vol. ciii, p. 64, 1813.)

"On a Saline Substance from Mount Vesuvius." (Vol. ciii, p. 256, 1813.)

"A Few Facts Relative to the Coloring Matter of Some Vegetables." (Vol. cviii, p. 110, 1817.)

IN THE PHILOSOPHICAL MAGAZINE.

"On Quadruple and Binary Compounds: Particularly Sulphurets." (Vol. xxix, p. 275, 1807.)

IN THOMSON'S ANNALS OF PHILOSOPHY.

"On a Native Compound of Sulphuret of Lead and Arsenic." (Vol. xiv, p. 96, 1819.)

"On a Native Aluminate of Lead: or Plomb Gomme." (Vol. xiv, p. 31, 1819.)

"On a Fibrous Metallic Copper." (Vol. xvi, p. 46, 1820.)

"An Account of a Native Combination of Sulphate of Barium and Fluoride of Calcium." (Vol. xvi, p. 48, 1820.)

"On Some Capillary Metallic Tin." (Vol. xvii; new ser., vol. i, p. 271, 1821.)

"On the Detection of Very Minute Quantities of Arsenic and Mercury." (Vol. xx; new ser., vol. iv, p. 127, 1822.)

"Some Improvements in Lamps." (Vol. xx; new ser., vol. iv, p. 363, 1822.)

"On the Crystalline Form of Ice." (Vol. xxi; new ser., vol. v, p. 340, 1824.)

"A Means of Discrimination Between the Sulphates of Barium and Strontium." (Vol. xxi; new ser., vol. v, p. 359, 1823.)

"On the Discovery of Acids in Mineral Substances." (Vol. xxi; new ser., vol. v, p. 384, 1823.)

"An Improved Method of Making Coffee." (Vol. xxii; new ser., vol. vi, p. 30, 1823.)

"A Discovery of Chloride of Potassium in the Earth." (Vol. xxii; new ser., vol. vi, p. 258, 1823.)

"On Some Compounds of Fluorine." (Vol. xxiii; new ser., vol. vii, p. 100, 1824.)

"An Examination of Some Egyptian Colors." (Vol. xxiii; new ser., vol. vii, p. 115, 1824.)

"Some Observations on Mr. Penn's Theory Concerning the Formation of the Kirkdale Cave." (Vol. xxiv; new ser., vol. viii, p. 50, 1824.)

"A Letter from Dr. Black Describing a Very Sensible Balance." (Vol. xxiv; new ser., vol. x, p. 52, 1825.)

"A Method of Fixing Crayon Colors." (Vol. xxvi; new ser., vol. x, p. 236, 1825.)

All the above were reprinted in vol. xxi (1879) of the *Smithsonian Miscellaneous Collections*, under the title "The Scientific Writings of James Smithson." They consist of about 117 printed pages.

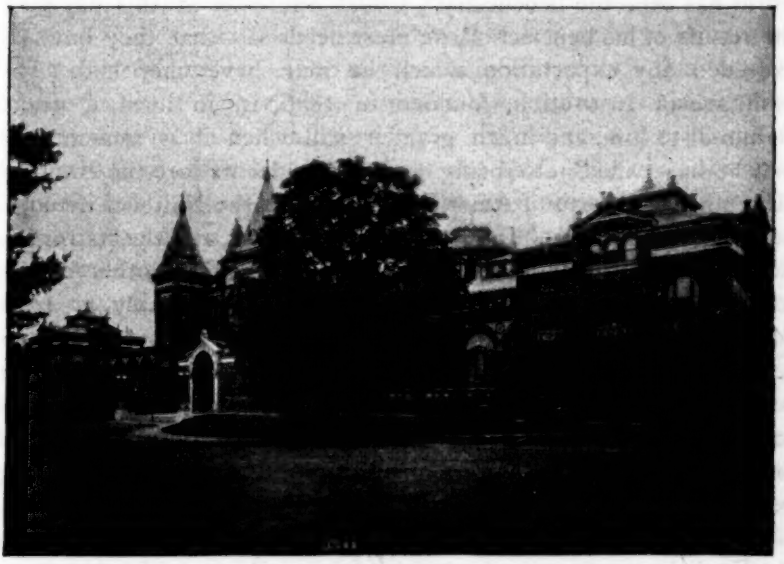
His published writings did not represent all of his work, as 200 of his manuscripts (covering a wide range of subjects—history, the arts, languages, rural pursuits, etc.), were forwarded to the United States with his effects. All these, with the exception of one small volume, were burned in the fire at the Smithsonian Institution in 1865. His cabinet, destroyed at the same time, consisted of a choice collection of minerals of 8,000 or 10,000 specimens, and included examples of most of the meteorites which had fallen in Europe during several centuries.

Smithson's will was a model of simplicity. In it he describes himself thus:

"I, James Smithson, Son to Hugh, first Duke of Northumberland, & Elizabeth, Heiress of the Hungerfords of Studley, & Niece to Charles, the proud Duke of Somerset, now residing in Bentinck Street, Cavendish Square, do this twenty-third day of October, one thousand eight hundred and twenty-six, make this my last Will and Testament."

His will directed that an annuity of £100 should be paid his ormer servant, John Fitfall, during life; that sums of money which

had been lent to another former servant, Henry Honore Sailly, should be allowed to remain with the debtor for five years from the date of the will at 5 per cent. per annum. The income of his estate, with the exception noted above, was bequeathed to his nephew, Henry James Hungerford, who was empowered to make a jointure should he marry. To Hungerford's children, should he have any, the estate was bequeathed absolutely and forever in such shares as the father might care to direct, and, should he fail to direct such division, then the estate was to be divided among the children



United States National Museum.

in such shares as the Lord Chancellor might deem proper. The clause which is of especial interest, is the following: "In the case of the death of my said nephew without leaving a child or children, or the death of the child or children, he may have had under the age of twenty-one years, or intestate, I then bequeath the whole of my property, subject to the Annuity of One Hundred Pound to John Fitfall, & for the security & payment of which I mean Stock to remain in this Country, *to the United States of America, to found at Washington, under the name of the Smithsonian Institution, an Establishment for the increase & diffusion of knowledge among men.*"

It would be difficult to excel the simple majesty of the last few words of that clause. Possibly no higher tribute has ever been paid to the honor of the people of the United States than the absolute trust which Smithson reposed in them when he placed in their hands what was at that time a very large fortune (about one-half million dollars) without hedging it all about with directions, restrictions and safeguards of various kinds. His wishes as to trustees, place, name, purpose and beneficiaries are all told in twenty-eight words, and those few words have afforded the means for wonderfully increasing the stock of human knowledge of all kinds, and the whole world has been the beneficiary. Could Smithson at this day view the results of his benefaction, he must needs say that they have far exceeded any expectation which he may have cherished. The Smithsonian Institution, founded in 1846, is, in itself, a grand memorial to him, and much grander still when it is remembered that it has called into being and has under its care the National Museum, the Bureau of American Ethnology, the National Zoological Park, the Bureau of International Exchanges, and the Astrophysical Observatory, and that it has mothered various other of the scientific bureaus of the Government's work. Probably no trust has ever been more honorably and successfully administered, and certainly none has had so great effects both at home and to the far corners of the earth. The seal of the Smithsonian Institution contains the words from Smithson's will, "For the increase and diffusion of knowledge among men," and the words *per orbem* have been added.

Smithson died June 27, 1829, at Genoa, Italy, and was buried in the English cemetery on the heights of San Benigno. A few years ago the Smithsonian Institution placed a tablet on his tomb and a similar tablet in the English church in the city of Genoa.

Last January, through the agency of Prof. Alexander Graham Bell, acting on behalf of the Regents of the Smithsonian Institution, his remains were brought to this country and are to find a final resting-place in the Smithsonian Park, under the shadow of the institution which he founded.

The United States despatch-boat "Dolphin" was sent to New York to receive the remains upon their arrival in this country and to bring them to Washington. Here they were placed upon a gun-carriage and with a military escort were brought to the Institution

to be received there with simple but impressive ceremony. At the present time they rest in the Regents' room of the Smithsonian Institution, awaiting the selection of a proper spot for sepulture.

NOTES FROM JOSEPH INCE'S BOOK ON ELEMENTARY DISPENSING PRACTICE.

By M. I. Wilbert.

Mr. Joseph Ince has embodied such a wealth of interesting personal opinions, as well as suggestive and practical ideas, in his little book on "Elementary Dispensing Practice" (Amer. Jour. Pharm., 1904, p. 145), that it was thought that a few extracts or random notes might prove interesting to practical pharmacists in this country. In the preface Mr. Ince, himself nearly, if not quite, an octogenarian, gives a description of what is evidently his ideal for a dispenser. He says: "Many years ago I stood by the side of an excellent and experienced dispenser whose example was a perpetual lesson in this branch of pharmaceutical education. His work was rapid, for he was of the opinion that slow dispensing by no means leads to accuracy. His method was the very soul of order, for he returned every bottle to its place as soon as done with, and in the very press of business carefully read his prescriptions and then wrote his labels, which he kept constantly before him so as to avoid the smallest chance of error. Save the final wrapping up and sealing, each separate piece of work was finished out of hand, judgment being used as to what should be attempted first."

Having this ideal in mind, it is little wonder that Mr. Ince has profited by his experience and is able to tell us how we ourselves may become more efficient in this particular branch. This he does a little further on, when he tells us that: "Success in any branch of knowledge depends on the perpetual culture of the talent of observation. This is particularly applicable to the would-be dispenser, who should train himself to recognize the chief preparations, liquid and solid, which he sees around him, including drugs in common use.

"He will dispense best who during his apprenticeship has become familiar with the physical characteristics, general behavior and ordinary doses of the various drugs, chemicals and preparations with which he comes in contact."

Under prescription reading Mr. Ince says: "When a physician writes a prescription for a patient in the well-known semi-classical manner, the dispenser must be able to understand what has been written before he can rightly fulfil the intentions of the prescriber.

"These intentions are expressed in technical contracted Latin, definite and perfectly intelligible when once mastered; far more definite than instructions conveyed in English, and less liable to be misunderstood."

The importance of being thoroughly familiar with these various technical and usually much-abbreviated words and terms is well illustrated by two letters that have but recently appeared in *American Medicine* (Dr. J. M. Miller, *Am. Med.*, 1904, p. 380, and Dr. L. D. Sheets, *Am. Med.*, 1903, p. 1014), in which the writers complain that the Latin term *ad* had been repeatedly mistaken for the English word add. Mr. Ince calls attention to this same possibility, and says that the difference between ad and add should be carefully noted. "*Ad* is a preposition which governs the accusative case and means up to, or up; *Q. S. quantum sufficiat* (as much as may be sufficient) often precedes *ad*. Add, when used in connection with Latin abbreviations or directions, is itself an abbreviation of the Latin word *adde* (add thou)." More often, however, it is used as the English word add.

Considerable attention is given to the discussion of the use and non-use of heat in making simple solutions The application of heat to effect solution demands considerable knowledge of the physical properties of drugs and chemicals. "It is obvious that to apply heat to substances that are themselves readily soluble, or are readily decomposed or volatilized, would be considered poor dispensing and would betray a want of common sense."

In this connection it is also quite necessary to have considerable knowledge of the comparative solubility of substances in hot and in cold water. Potassium chlorate, for instance, being sparingly soluble in cold water and readily soluble in boiling water, is best treated without heat to avoid the large crystals that are invariably formed by this substance on cooling.

Of powders Mr. Ince says that they should be weighed out one by one: "It is bad practice to take the total weight ordered and divide it subsequently into the required number by the aid of a spatula, not by the scales and weight. It is worse to dip out grain

doses of powdered opium from a wide-mouth stock-bottle thinking no evil." In speaking of mixing powders he says that "powders dispensed on the usual small scale are better mixed with a paper or palette knife on paper and sifted, than by titration in a mortar."

"In compound powders ingredients ordered in smallest quantities should be added first and larger quantities last."

Under pill excipients Mr. Ince gives the formula for a number of mixtures that may prove useful, and are at least interesting.

"Hydrated glycerin: Glycerin, 4; distilled water, 1; mix. Glucose excipient: Glucose, 12; glycerin, 4; distilled water, 1; mix. Honey excipient: Clarified honey, 2; distilled water, 1; mix. Proctor's paste: Glycerin, 9 c.c.; powdered tragacanth, 3 grammes; distilled water, 4 c.c.; mix. Triturate the tragacanth with the glycerin and then add the water."

Among other excipients he recommends the use of manna as having many special applications. Among absorbents he recommends powdered licorice, precipitated calcium phosphate and calcined magnesia.

Mr. Ince lays much stress on the desirability of incorporating every potent remedy that is capable of solution in that state so as to be absolutely sure of the particles being thoroughly subdivided.

In speaking of ointments he says: "It is indispensable that the active ingredients be reduced to a perfectly miscible condition, and wherever possible added in solution.

"All crystalline bodies incorporated into an ointment need the utmost care in dispensing; they should be reduced to an impalpable powder, dissolved when possible, but always rendered absolutely smooth."

In making ointments by fusion it is necessary to know the relative melting points of the bases and to regulate and adjust the order of melting so that the substance requiring the highest degree of heat is melted first, the remaining bases being added in the sequence suggested by their melting points, so that the necessary heat may be gradually reduced and in this way avoid burning or scorching the most delicate ingredients.

Under "Quisquilliæ" that might have quite properly been called "that which is valuable," Mr. Ince has arranged a number of interesting suggestions, from which we have taken the following:

"A mortar should not be used to dissolve a readily soluble salt or substance.

"No metallic substance should come in contact with unguentum hydrargyri nitratis.

"Chloroform and menthol are insoluble in glycerin.

"A new label must on no account be pasted over an old one; former directions and labels must be removed.

"Hydrochloric acid is a safe expedient for removing stains from the hands.

"The art of keeping tinctures of a uniform color is to reserve an eighth part of the old make and add to it the fresh preparation. Tincture of orange-peel may be taken as an example.

"Tabulate doses of potent remedies; the rest may be learned by constant reference.

"Hesitate before giving an opinion as to whether a preparation is used or not. This is an affair of locality; if in your district there is no demand for a certain article, it may be extensively used elsewhere.

"Before actual dispensing, write the labels. When a prescription contains various preparations, make the suppositories first (if any) and set any infusion not in readiness. Time is thus economized.

"It is against all rules of pharmacy to substitute one substance for another in case of being out of a particular drug."

THE METRIC SYSTEM.

SOME NOTES ON HERBERT SPENCER'S OBJECTIONS TO THE USE OF DECIMALS.

By M. I. Wilbert.
Apothecary at the German Hospital, Philadelphia.

The objections made by the late Herbert Spencer to the introduction of the metric system of weights and measures into England are in their nature so far-reaching that some additional information regarding them may not be out of place at the present time. This is particularly true in view of the fact that a bill for the speedy and compulsory introduction of the metric system has but recently passed second reading, without a single objection, in the British House of Lords.

That Mr. Spencer himself was sincere in his objections is evidenced from the provisions he made in his last will and testament; where it was found that he directed that if at any time, after his death, a concerted effort should be made to introduce a decimal system of

weights and measures, or a decimal monetary system, into Great Britain, his objections to such a system should be republished, in pamphlet form, and distributed among members of Parliament.

As noted in the article recently published in this JOURNAL (A. J. P., 1904, page 125), Mr. Spencer's objections first appeared as a series of anonymous letters, four in number, in the *London Times.*

They were republished in this country, by permission, under Mr. Spencer's name, in the June (1896) number of Appleton's *Popular Science Monthly.*

The same Journal, in October, 1896, published an article by Prof. J. C. Mendenhall, President of the Worcester Polytechnic Institute, in which the latter reviews the arguments advanced by Mr. Spencer and refutes many of the statements made by him, particularly those relating to the accuracy or lack of accuracy in the standard units of the metric system.

In Professor Mendenhall's paper the futility of many of the arguments advanced by Mr. Spencer in his several letters is gone into at some length, but as neither the arguments nor the answers are of much interest to us as pharmacists they need not be repeated here at length.

Some exception, however, might well be made to the basic or real objection advanced by Mr. Spencer to the metric system. This appears first in the second letter of the series, where it develops that his objections are not directed so much against the standards of the metric system as they are against the introduction of any system that is decimal in character, feeling, as Mr. Spencer did, that our system of numeration by ten, and multiples of ten, was not in harmony with the more advanced needs of modern civilization. It is in this same letter that he suggests the great advantage of a duodecimal system of numeration; largely on account of the number of factors by which twelve or a multiple of twelve would be divisible.

Singularly enough he answers his own argument in a most satisfactory way when he says, "Do I think this system will be adopted? Certainly not at present—certainly not for many generations," and adds: "In our days the mass of people, educated as well as uneducated, think only of immediate results; their imaginations of remote consequences are too shadowy to influence their acts."

That Mr. Spencer had a proper appreciation of the inherent advantages of a rational system of weights and measures that was, or

would be, generally adopted, and that he was not above recognizing the fact that the metric system had done much toward achieving this ideal, is evident from the following quotation.

In speaking of the history and development of the metric system, he says: "The idea was a great one, and, allowing for the fundamental defect on which I have been insisting, it was admirably carried out. As this defect does not diminish its great convenience for scientific purposes, the system has been gradually adopted by scientific men all over the world; the great advantage being that measurements registered by a scientific man of one nation are without trouble made intelligible to those of another."

Recognizing and admitting the numerous advantages that scientific men have derived from the introduction and use of the metric system, Mr. Spencer was, nevertheless, not willing to admit that the small tradesman or his customers would or could appreciate or use a system of weights and measures, or a system of coinage, based on a decimal plan, without seriously interfering with their ability to do business.

This line of argument sounds strange to us in this country, where, we think at least, we have adapted ourselves to a decimal system of currency.

How complicated our monetary system appeared to Mr. Spencer is evidenced when he says, referring to quotations on the New York Stock Exchange: "Are the quotations of prices in dollars, tenths, and cents? Not at all. They are in dollars, halves, quarters and eighths." "That is to say, the decimal divisions of the dollar are entirely ignored, and the division into parts produced by halving, re-halving, and again halving, is adopted."

In this practice Mr. Spencer does not recognize a possible adaptation of the decimal system of numeration, but accepts it as evidence of an impediment or even—retrogression.

The same line of thought is evident when he quotes from the communication of a French correspondent, who says: "By adopting the decimal metric system, we have not made the old denominations to disappear entirely, but we have greatly reduced their use." Instead of accepting this as evidence of the adaptability of metric weights and measures, Mr. Spencer puts it forward as an argument against the popularity of the decimal system among the French people. This objection to our decimal system of numeration

has led Mr. Spencer to assert that rather than adopt a universal system of weights and measures based on a decimal plan, "It will be far better to submit for a time to the evils which our present mixed system entails."

In conclusion I should like to say that few people will disagree with Mr. Spencer as to the possible advantage that might be derived from a system of numeration more adaptable than our present system of decimals, and but few, very few, will differ from him as to the impracticability of introducing such a system at the present time; be it octonary, duodecimal, or sexadecimal.

Many, particularly in this country, must fail to see how a monetary system, or a system of weights and measures, based on a decimal plan, could in any way impede trade or interfere with the possible adoption of any improved system of numeration that might be devised in the future.

THE GENUS EUCALYPTUS.

By Henry Kraemer.

One of the most interesting genera of plants both from a botanical and economical point of view is that of eucalyptus. When the late Baron F. von Mueller prophesied that this genus would "play a prominent part for all time to come in sylvan culture of vast tracts of the globe; and for hard-wood supplies, for sanitary measures, and for beneficent climatic changes all countries within the warmer zones will with appreciative extensiveness have to rely on our eucalypts during an, as yet, uncountable period," he probably little realized that in twenty-five years after the publication of his classical work on "Eucalyptographia" it would already be the most extensively cultivated genus of forest trees, and also recognized to be the most valuable.

During the past year or so several very valuable monographs on the eucalypts have appeared, and it is the purpose of the author of the present paper to review these publications together. J. H. Maiden[1] is publishing a "Critical Revision of the Genus Eucalyptus." This work is appearing in parts, and the remaining numbers will be issued as rapidly as the plates can be made, three parts

[1] J. H. Maiden, Government Botanist of New South Wales and Director of the Botanic Gardens, Sydney.

having already appeared. Baker and Smith[1] have published a large monograph on the genus, their work having special regard to the essential oils yielded by the various species, and Alfred James McClatchie has published an interesting monograph[2] on the eucalypts cultivated in the United States.

The genus Eucalyptus was named by L'Heritier in 1788, from the two Greek words meaning "I cover well," "in allusion to the operculum or lid which covers the calyx until the stamens are fully formed." The plants are evergreen and vary from shrubs to trees of enormous height, probably some of them being the highest trees known. Kerner[3] gives the height as 140 to 152 metres. The leaves frequently vary in shape and in position on both young and mature trees; they are fixed vertically, and not horizontally as the leaves of our trees, the petiole being twisted. The leaves furthermore contain large oil-secreting reservoirs. The flowers are arranged in cymes or axillary umbels and are devoid of petals; the usually whitish stamens are inflexed in the bud and expand when the operculum is removed, giving the name as already stated to the genus. The fruit is a 3- to 6-celled truncated capsule, or pyxis. The seeds are small and very numerous, the sterile ones predominating; this is no doubt one reason why there has been so much difficulty in producing seedlings.[4]

With a genus of so many species and numerous varieties it was to be expected that there would be considerable confusion in regard to the accurate determination of its members. Tate and Luehman give prominence to the fruit for purposes of classification. Maiden, however, says that all of its characters display a puzzling amount of variation, and concludes that for herbarium work the best characters are afforded by the anthers and fruits; whereas the scientific forester will be largely guided by the nature of the bark and timber. Baker and Smith, in addition to morphological characters, base their deductions on the chemical properties and physical characters of oils, dyes, kinos, etc. These authors have probably the most

[1] Richard T. Baker, Curator and Economic Botanist of the Technological Museum, New South Wales; and Henry G. Smith, Assistant Curator and Chemist of the Technological Museum, New South Wales.

[2] This is Bulletin No. 35, of the Bureau of Forestry of the U. S. Department of Agriculture.

[3] "Natural History of Plants," Vol. I, p. 722.

[4] McClatchie, *loc. cit.*, p. 44.

comprehensive view of the subject, and are less likely to err in their conclusions, as experience covering many years has shown them that a species founded on field studies, the usual morphological data, as well as structure and nature of cell contents, is practically constant in specific characters. This is in a certain sense the most interesting part of their work. It is not at all unlikely that the next important classification of plants will be based largely on such histological and physiological data as Baker and Smith have considered in their studies on this single genus. Engler and Prantl have attempted to utilize in a measure this kind of information on the entire plant kingdom, but it has been unsatisfactory, because the work done is not sufficient and in most cases still requires confirmation. Baker and Smith have made an excellent beginning, and have set the pace for all writers of monographs on other plant genera.

Baker and Smith have divided the eucalypts into the following groups, based on the character of the oils they yield:

GROUP I.—Eucalypts which give an oil consisting LARGELY OF PINENE, without phellandrene, and in which eucalyptol is almost or quite absent: *Eucalyptus tesselaris, E. trachyphloia, E. terminalis, E. corymbosa, E. intermedia, E. eximia, E. botryoides, E. robusta, E. saligna, E. nova-anglica, E. umbra, E. dextropinea, E. Wilkinsoniana* and *E. lævopinea.*

GROUP II.—Eucalypts which yield an oil consisting principally of PINENE and EUCALYPTOL, but in which the latter constituent does not exceed 40 per cent., phellandrene being absent: *Eucalyptus Baeuerleni, E. propinqua, E. affinis, E. paludosa, E. tactea, E. rubida, E. intertexta, E. maculata, E. microcorys, E. hemilampra, E. quadrangulata, E. conica, E. Bosistoana, E. eugenioides* and *E. paniculata.*

GROUP III, CLASS A.—Eucalypts which yield an oil consisting principally of eucalyptol and pinene, and in which the EUCALYPTOL EXCEEDS 40 PER CENT., phellandrene being absent: *Eucalyptus resinifera, E. polyanthema, E. Behriana, E. Rossii, E. pendula, E. dealbata, E. tereticornis* var. *linearis, E. rostrata* var. *borealis, E. maculosa, E. camphora, E. punctata, E. squamosa, E. Bridgesiana, E. goniocalyx, E. bicolor, E. viminalis* var. (*a*), *E. populifolia, E. longifolia, E. Maideni, E. globulus, E. pulverulenta, E. cinerea, E. Stuartiana, E. Stuartiana* var. *cordata, E. Morrisii, E. Smithii* and *E. sideroxylon.*

GROUP III, CLASS B.—Eucalypts which yield an oil containing OVER 40 PER CENT. OF EUCALYPTOL, but in which the pinene is dimin

ishing and AROMADENDRAL is making its appearance, thus approaching the typical "Boxes," phellandrene being absent: *Eucalyptus Cambagei, E. polybractea, E. dumosa, E. oleosa, E. cneorifolia* and *E. stricta.*

GROUP III, CLASS C.—Eucalypts which yield an oil containing over 40 PER CENT. of EUCALYPTOL, but in which PHELLANDRENE is making its appearance, thus approaching the phellandrene oils: *Eucalyptus melliodora* and *E. ovalifolia* var. *lanceolata.*

GROUP IV.—Eucalypts which yield an oil consisting largely of *eucalyptol, pinene* and *aromadendral,* but in which the EUCALYPTOL DOES NOT EXCEED 30 PER CENT., and in which phellandrene is absent: *Eucalyptus tereticornis, E. punctata* var. *didyma, E. gracilis, E. viridis, E. Woolsiana, E. albens* and *E. hemiphloia.*

GROUP V.—Eucalypts which yield an oil consisting of PINENE, EUCALYPTOL and PHELLANDRENE, but in which eucalyptol does not exceed 30 per cent.: *Eucalyptus viminalis, E. rostrata, E. ovalifolia, E. Dawsoni, E. angophoroides, E. fastigata, E. macrorhyncha, E. capitellata, E. nigra, E. pilularis, E. Planchoniana, E. acmenoides, E. fraxinoides, E. Fletcheri, E. microtheca, E. hæmastoma, E. sideroxylon* var. *pallens, E. creba, E. siderophloia* and *E. melanophloia.*

GROUP VI, CLASS A.—Eucalypts which yield an oil consisting largely of PHELLANDRENE, EUCALYPTOL and the PEPPERMINT KETONE, but in which the eucalyptol does not exceed 30 per cent.: *Eucalyptus piperita, E. amygdalina, E. vitrea* and *E. Luehmanniana.*

GROUP VI, CLASS B.—Eucalypts which yield an oil consisting largely of PHELLANDRENE and the PEPPERMINT KETONE, and in which EUCALYPTOL IS ALMOST, IF NOT QUITE, ABSENT: *Eucalyptus coriacea, E. Sieberiana, E. oreades, E. dives, E. radiata, E. Delegatensis,* and *E. obliqua.*

GROUP VII.—Eucalypts which yield an oil not readily placed in the other groups: *Eucalyptus stellulata, E. Macarthuri, E. aggregata, E. virgata, E. patentinervis, E. apiculata* and *E. citriodora.*

Eucalyptus obtusiflora yielded no oil upon distillation.

After many attempts Baker and Smith were unable to obtain material for oil-distillation of the following species: *Eucalyptus acaciæformis, E. alpina, E. Baileyana, E. incrassata, E. ochrophloia, E. odorata, E. regnans, E. uncinata* and *E. Perriniana.*

The authors have shown in a diagram the probable evolution of the eucalypts as indicated by their studies on the botanical and chemical characters of the genus.

The monograph is an interesting one, with numerous excellent illustrations, and contains very many new facts in addition to an entirely new presentation of the subject. Not the least interesting is the fact that many (nearly thirty) species of Eucalyptus yield an oil resembling that obtained from *E. globulus*, containing over 40 per cent. of eucalyptol, and that the oil of eucalyptus, *e. g.*, *E. globulus*, is the same in character and constituents, no matter where the trees are grown. It has been heretofore supposed that the oils of *E. globulus*, *E. cneorifolia* and a few others, which have been derived from trees growing in the southern States (as Tasmania or South Australia) were superior to those obtained from trees growing elsewhere, as in New South Wales, whereas this preference is in reality due "to the perseverance and persistency of the companies working these species, and especially to the pioneers in the industry having established themselves in the neighboring States." The statement is made that "the demand for oils rich in eucalyptol can now be met by the distillation of species growing in New South Wales and from which the present requirements of the world could be supplied."

It is furthermore of interest, that, according to McClatchie, no less than eight species of the eucalypts, yielding an oil containing over 40 per cent. of eucalyptol, are being cultivated in the United States.

Over forty species of Eucalyptus[1] have been grown successfully in the United States. The following species are adapted to hot, humid regions and will produce useful timber: *Eucalyptus botryoides*, *E. citriodora* and *E. resinfera*.

The following are best adapted to warm, moderately humid regions having light winter frosts, and are most suitable for producing timber valuable for commercial purposes: *Eucalyptus botryoides*, *E. diversicolor*, *E. globulus*, *E. gomphocephala* and *E. tereticornis*.

The following are adapted to situations not excessively warm during summer, but frosty during winter, and are most likely to give good results in the Southwest: *Eucalyptus gunnii*, *E. leucoxylon*, *E. polyanthema*, *E. rudis* and *E. tereticornis*.

The following are adapted to dry regions free from heavy frosts, and produce valuable timber: *Eucalyptus corynocalyx*, *E. creba*, *E. diversicolor*, *E. globulus*, *E. leucoxylon*, *E. polyanthema*, *E. sideroxylon* and *E. tereticornis*.

---

[1] McClatchie, *loc. cit.*, p. 85.

The following are adapted to moderately moist mountain situations: *Eucalyptus coriacea, E. eugenoides, E. gunnii, E. leucoxylon, E. obliqua, E. piperita, E. rudis* and *E. Stuartiana.*

The following are adapted to regions dry and hot during the summer and frosty during the winter: *Eucalyptus corynocalyx, E. hemiphloia, E. leucoxylon, E. microtheca, E. polyanthema, E. rudis, E. tereticornis* and *E. viminalis.*

The following are adapted to cultivation on alkali soils: *Eucalyptus cornuta, E. robusta* and *E. rostrata.*

The eucalypts which are growing and fruiting at the present time in the United States serve the following uses: Forest cover, windbreaks, shade, fuel, posts, railway ties and other underground purposes, piles, street paving, telegraph poles, shipbuilding, vehicle making, agricultural implements, furniture and cabinet-making, etc.

The following species, growing in the United States, are useful as a source of either oil, kino or honey: (*a*) As a source of oil: *E. amygdalina, E. eugenoides, E. globulus* and *E rudis.* (*b*) As a source of kino: *E. calophylla, E. corymbosa, E. rostrata, E. siderophloia* and *E. sideroxylon.* (*c*) As a source of honey: *E. calophylla, E. citriodora, E. corynocalyx, E. hemiphloia, E. leucoxylon, E. longifolia, E. melliodora, E. pilularis, E. polyanthema, E. rostrata, E. rudis, E. sideroxylon* and *E. tereticornis.*

A SYMPOSIUM ON THE MEANING OF THE TERMS PHARMACOLOGY, PHARMACOGNOSY, MATERIA MEDICA AND RELATED TERMS.

(*Continued from p. 145.*)

Owing to the recent developments in the study of pharmacology, and also owing to the confusion which seems to exist in the minds of a good many people in regard to the meaning of this and other terms, applied in the study of drugs and medicines, it occurred to the editor of this JOURNAL that it would be interesting and profitable to have these terms defined according to their modern acceptation and uses; and with this end in view letters have been sent to a number of physicians, and professors in these branches, in various parts of the country. The first installment of replies was published in our March issue and the remainder follow in the order of the dates on which they were written or received:

Mr. Henry Kraemer, Editor of the AMERICAN JOURNAL OF PHARMACY:

The definitions which I have adopted in my Therapeutics and Materia Medica for the words Pharmacology, Pharmacognosy and Materia Medica follow closely the etymology of those terms and agree generally with the definitions given in the Standard Dictionary. The Greek word Pharmacon is acknowledged to mean a drug or medicine. Pharmacopœia literally means "I make medicines," *i. e.*, give the directions for preparing and compounding medicines.

Pharmacology can only be the science of drugs. In its broadest application it includes everything relating to drugs, their preparations and their effects, both upon the human body and the lower animals. Some of its departments are Medical Botany, Ecology, Pharmacognosy, Pharmacy, Pharmacodynamics. In the last, Therapeutics may be included to the extent that it refers to the employment of drugs in the prevention or treatment of diseases.

Materia Medica comprises what a physician should know about the remedies in repute for the treatment of diseases. It is an elastic term and may be extended so as to correspond with Pharmacology, or, on the other hand, limited to the articles in the Pharmacopœia. Pharmacognosy is the knowledge of the qualities of unprepared medicines. It may also be defined as the science of poisons, but it should not be so used. Pharmacodynamics studies the physiological action of drugs.

Very truly yours,

JOHN V. SHOEMAKER.

1519 WALNUT STREET, February 4, 1904.

Dear Dr. Kraemer:

I scarcely know how to answer your query as to the meaning of Pharmacology, etc., and, to tell the truth, have little taste for these discussions. Pharmacology I have always used to indicate the study of the effects of drugs or reactions observed between chemical agents and living matter, without reference to the purpose for which they are used. It thus includes the action of drugs and poisons on plants and animals, whether normal or diseased, and whether applied to injure or kill (poisons) or to heal (drugs). One branch of it, embraced under *therapeutics*, deals with the effects in disease; another, *toxicology*, with the effects of poisonous doses. Pharmacology takes, to my mind, no cognizance of the origin of the chemical agent nor, in fact, of its chemical nature. Materia Medica—a much older term—

indicates the study of drugs before the modern experimental methods were introduced, and may still be used to include knowledge of the type then extant, such as the origin and chemical nature of drugs, their more striking effects and their method of preparation and dosage. Much of this knowledge is, however, now denoted under Pharmacognosy, and, in fact, the old term Materia Medica may be regarded as becoming superfluous, that side of it which looked towards the chemical side being known as pharmacognosy, while the effects on living matter, which were in later years included under Materia Medica, may now be placed under Pharmacology.

There is, as you say, much confusion in regard to the use of the terms. I think that in the history of the word, pharmacology was first used in the same sense as pharmacognosy at present. Pharmacognosy is, I fancy, a comparatively recent term.

If your symposium tends to define the meaning of these terms, it will not have been in vain; but I suppose nothing less than the *fiat* of an academy would suffice to bring order into the present confusion.

Yours sincerely,

ARTHUR R. CUSHNY.

UNIVERSITY OF MICHIGAN, February 6, 1904.

My dear Professor Kraemer:

The composite nature of our language often accounts for what seems to be flagrant irregularities in the meanings assigned to words. As a consequence it is impossible for many English words, such as are constructed out of one or more foreign equivalents, each possessing several shades of meaning, to dispossess themselves of their original genetic dualism or polyism. Of course, there are many Latin and Greek words that carry only a single thought or conception, and correctly preserve this unicism when transferred, somewhat changed, as a correlative in English. Thus when the Latins wished to convey the simple idea of *wood*, the connection, as sometimes in English, alone determined which specific word should be employed—*lignum*, *materia*, *silva*, *nemus*, *lucus*, *saltus*—as each was accepted to be used differently and under no condition interchangeably. There are, however, so many of our foreign derivatives possessing a dual significance that, as a people, we are not slow in accepting such possibilities, or better advantages, wherever they happen to occur. Even in translations, irrespective of source, we

all have noticed another cause for dualism—the great difference between the literal and liberal rendition, for it is this that ofttimes, through a process of evolution, creates a general significance out of the specific. So when we come to consider these three terms: materia medica, pharmacology, and pharmacognosy—we should not lose sight of the prior condition of service in the mother tongue of the component units or words.

(1) MATERIA MEDICA.—Here we have two Latin simples; the former (*materia, æ*), a singular, feminine noun, signifying liberally—matter, material, stuff, of which anything is composed, in the very widest sense; the latter (*medica, us, a, um,*), an adjective with feminine, singular termination, in agreement with materia, signifying literally—medical, curative, of or belonging to healing. The term, therefore, means, medical matter, medical material, medical stuff, and, although written in the singular, the word materia implies collectiveness, plurality; hence, curative remedies, agents, be these what they may. In pursuance of this idea we refer constantly to the matter or material of the universe, including without question, at least, all that is unorganized, and possibly equally well the organized. Liberally, the term is accepted as including everything employed to palliate physical suffering, and the scientific treatment of such agents is reduced to a science bearing the name. "Medical material" is certainly very comprehensive, and a work titled "Materia Medica" is absolutely without restriction as to quantity and quality of its contents, so long as all included substances are believed to possess curative power. Heat, cold, light, darkness, electricity, galvanism, massage, hydropathy, simple mechanical appliances are all within its scope, just as much so as the more important organic and inorganic drugs. There is no doubt but that in the earlier days of medicine, when the term "materia medica" was selected, it was intended to include all curative agents as well as all important knowledge pertaining thereto. But drugs at that time, be it remembered, were by no means so well understood as at present, inasmuch as their treatises then were restricted chiefly to the source, physical description of the crude parts (botanically, chemically, etc.), doses, acceptable preparations, method of manufacture, etc., having little or nothing to say concerning the application of drugs to the well or sick organism. The original science consequently occupied a somewhat limited field compared with that

of to-day, from the fact that as science in general became more popular, the progressive medical minds desired to know the whys and wherefores of results obtained through medicines. This laudable ambition opened the way to an endless amount of experimentation, which has resulted in the ultra scientific individual preferring to draw a line between the primitive conception, *descriptive*, and the more modern, *applied*, and to each assign distinctive names—to the former materia medica, or pure materia medica; to the latter, pharmacology and therapeutics.

(2) PHARMACOLOGY, Gr. φάρμακον (pharmocon) + λόγος (logos), λογια (logia)—pharmaco(n)log(-ia)y. Here again we have two foreign simples contributing to form our term, each carrying several meanings; the former (φάρμακον) signifies literally—any artificial means for producing physical effects, which again is very comprehensive, but the Greeks shaded this conception by assigning to it a more restrictive meaning—a medicine, drug, remedy; thus Æschylus wrote: φάρμακον νόσου, a medicine for sickness; the latter word (λόγος) is equally sweeping, for natives employed it so universally—sometimes to mean a word, or words, a saying, speaking, language, talk, statement, dialogue, conversation, discussion, discourse, history, account, consideration, etc. Consequently it is evident, should we so desire, there is nothing etymologically that could prevent the employment of the word pharmacology with the broadest latitude—as a true synonym or companion term to materia medica, and in this sense it is accepted very often.

When about the middle of the last century some of the leading scientists, especially in Germany, took up experimental vivisection, and the application of drugs to the living animal, man included, the word pharmacology was coined, and ever since in that country it has maintained this restricted signification—the science of remedies, other than foods: how these when administered, in fine subdivision, act and produce changes in the living organism; the explanation of the symptoms created in health or sickness by substances detrimental or useful; how drugs effect our organs, tissues, fluids, secretions, etc., thereby accomplishing work. Thus it would seem to deal with *invisible theories*, while materia medica with *visible materials*, and thereby becomes but another name for the physiological action of drugs and their constituents in health and sickness. This field is so comprehensive, important and different from the older

materia medica, that it possibly deserved a specific name, and the one selected answers admirably, provided by common consent it can so be understood and observed universally.

(3) PHARMACOGNOSY, Gr. *φάρμακον* (pharmacon) + *γνῶσις, γνωσή* (gnosis, gnoso)—pharmaco(n)gnosy. Here, as in the two preceding cases, we have two foreign simples combined to form our English term; the former (*φάρμακον*) has already been explained under pharmacology; the latter (*γνῶσις, γνωσή*), as with λόγος, is very far reaching, it actively being equivalent to—a knowledge, an inquiry, knowledge of a higher order, deeper wisdom, acquaintance, knowing, recognizing. Again here, so far as etymology is concerned, there is no restriction of scope to which the term may apply, and yet it was instituted for conveying the idea of a masterly study of the drugs, but along a restrictive or special line, and for this, as seen above, the original roots give abundant license in the one shade of meaning, *recognizing*, *i. e.*, one drug from another by physical and chemical characters, which may be interpreted liberally as comprising the knowledge of selecting and identifying true and false specimens by such characteristics. Consequently this is the descriptive side of materia medica (science of describing drugs physically) as pharmacology is the experimental side—science of the action of drugs.

Conclusions:

(1) MATERIA MEDICA.—The older name for a treatise on curative agents, and although originally intended to be all comprehensive, is employed often at present in a restrictive sense—simply to a general consideration of the materials in all respects, save that of application—physiological action and therapy.

(2) PHARMACOLOGY.—Although literally a synonym of materia medica in its broadest sense, yet was intended originally to represent the experimental side of the subject—the application of agents to the system; how they act upon the healthy and sickly organisms, thereby revealing their possible value in curing disease.

(3) PHARMACOGNOSY.—Although a term equally comprehensive as the two preceding, yet it was created to represent the descriptive side of materia medica, so far as it may apply to describing, physically and chemically, the animal and vegetable crude drugs, disclosing thus by comparison the many distinguishing characteristics.

While the employment of these three terms in a liberal sense,

seems equally permissible, yet the exercise of this inherent quality has led to so much confusion that it would be far better to accept each in an independent spirit, or restrictively, as was intended, and now is preferred by many. Such, however, can only result through common consent and usage of the scientific workers, and these as a class seem almost as disinclined at present as in the past to use their best efforts towards harmony and uniformity.

DAVID M. R. CULBRETH, M.D.

1307 N. CALVERT STREET, BALTIMORE, February 11, 1904.

To the Editor of the AMERICAN JOURNAL OF PHARMACY:

When, twenty years ago, I first began critically to study definitions for my work, I observed the diversity even then existing in the meaning of the terms descriptive of the various medical sciences.

I then accepted the definitions as laid down by Dr. Hermann Hager in "Erster Unterricht des Pharmaceuten," and have never seen the necessity of materially changing my conception of his views of the subject. Hager, to my mind, was the world's greatest pharmaceutical author ("Schriftsteller" is more expressive), because he went to the root of every subject, and could therefore always be relied on, besides etymology was his especial fort.

Accordingly, pharmacology means literally the science of drugs—the very broadest term that could be conceived, since it comprises everything that pertains to the composite—"medicine"—except psychic and mechanic agents and influences, or the "immateria medica" of the present age, also known as the "non"-pharmaco-therapy, or the treatment of disease without drugs, from massage and electricity to climatology and "christian science" (?).

Since the confusion as to the meaning of the term pharmacology has arisen through the application of the term to describe experimental pharmacodynamics—the action of drugs on the living organisms in the normal state or health—by chiefly all English-speaking writers, it may be well to first consider some foreign authorities.

Of English authorities, Brunton appears to define pharmacology "as that division of materia medica which treats of the action of drugs on the living body."

Of French authorities, the great work of Littré, "Dictionnaire de Medicine, Chirurgie et Pharmacie" (Bailliere), says: "Materia medica is that part of pharmacology which treats of the origin, char-

acter and composition of medicinal substances; pharmacology comprising, in addition to this, also therapeutics."

Of German authorities, Theo. Husemann (Göttingen) "Gesammte Arzneimittellehre" makes the following classification:

PHARMACOLOGY—ARZNEIMITTELLEHRE.

(1) Pharmacognosy—Drogenwäaren Kunde.
(2) Pharmaceutical chemistry.
(3) Pharmacodynamics—action on normal organism.
(4) Therapy—action on abnormal organism.
(5) Compounding—Recepture-Kunst.
(6) Dosage—posology.

From these considerations, I would formulate the definitions as follows:

Pharmacology—the science of medicinal agents—material or ponderable.

Comprising these divisions:

Materia Medica.	Organic.	Inorganic.
Derivation.	Pharmacognosy.	Chemistry.
Character.	Physics.	"
Properties.	Chemistry.	"

Pharmacodynamics—toxicology, action and force of substances on living organism in normal state—health.

Therapeutics—action on abnormal living organism in disease; also comprises "immateria medica."

Pharmacy—preparation and compounding; really comprises all but pharmacodynamics; incidentally, therapeutics, to "serve" better "forms" of pharmaceutic agents.

I am especially interested in the effort to secure an intelligent understanding of these terms, since if the proposed definition of pharmacology were generally accepted, it could advantageously supersede the present unwieldy title of the Section on Materia Medica, Pharmacy and Therapeutics of the American Medical Association. Fraternally,

CARL S. N. HALLBERG, PH.G., M.D.

CHICAGO, ILL., February 16, 1904.

Dear Professor Kraemer:

I have had it in mind to comply with a request received from you some time ago for my understanding of certain words. What I

have jotted down now may be of no value, and may not accord with the ideas of others altogether.

PHARMACY.—(1) The art of preparing and compounding drugs for use as medicines. (2) The occupation of an apothecary. (3) The place of business of an apothecary.

The use of the word in the third of these senses is recent, and should be discountenanced.

PHARMACOLOGY.—That branch of science which relates to drugs, including their origin or source, the history of their medicinal use, their recognition in the several pharmacopœias, etc. Some recent writers have used the word in a restricted sense as the science of the action of medicines, which is properly called pharmacodynamics. In the larger meaning the word, no doubt, according to its etymology, might include both pharmacodynamics and pharmacognosy. It is better, in my judgment, to confine the use of the word to the range indicated in the above definition. This, I think, is in accordance with common usage.

PHARMACOGNOSY.—That knowledge of drugs which may be described as a practical acquaintance with them as objective things.

MATERIA MEDICA.—In its original and restricted sense, simply an enumeration of those articles employed as medicines, or as remedial agents. The term is, however, very commonly used in these days as a general one, including everything that belongs to a knowledge of drugs, so that pharmacology, pharmacognosy and pharmacodynamics are but branches of "Materia Medica." Such a use of the term is, however, not in accordance with etymology, and a purist would incline to make pharmacology the general word.

I have not consulted dictionaries in the foregoing definitions, but endeavored to state what seems to me to be the accepted and approved usage in literature.

Very truly yours,

A. B. LYONS.

DETROIT, MICH., March 4, 1904.

COLLEGE OF PHARMACY OF THE CITY OF NEW YORK.

The affiliation of the College of Pharmacy of the City of New York, on the seventy-fifth anniversary of the College, with Columbia University, on the same basis as Barnard College and Teachers

College, is a matter of more than passing moment. We are indebted to Mr. O. J. Griffin, assistant secretary of the College, for a typewritten account from stenographer's notes of the annual meeting of the College, held on March 15th, when the ratification of the union was effected.

Prof. Charles F. Chandler, who is president of the College, was unable to be present on account of illness, and in taking the chair, Vice-President Schieffelin said: "I regret exceedingly that President Chandler is ill in bed. He was taken with the grip to-day, but got up and dressed this evening, intending to come to this meeting, but they positively had to prevent his coming out." He then said: "The principal business before us to-night is to act upon the report of the special committee appointed by the Trustees to confer with the authorities of Columbia University. I have the honor to be chairman of that committee; but before presenting the report, I will read Dr. Chandler's letter, which most of you have received, but which is important enough to read again. The letter was as follows:

"The suggestion that this consolidation should take place came from the authorities of Columbia. The true significance of that should cause a great deal of gratification to every member of the College of Pharmacy, because it is undoubtedly an evidence that those gentlemen conisdered our College to be of the first rank. We have known this ourselves; but to the public it has been regarded as a college supported by the druggists and organized by the druggists, and to a certain extent a trade college. Why it hardly seemed to many of us ten or fifteen years ago, within the range of possibility to become a part of the University, although when I was abroad in Munich and saw the students studying pharmacy, the regularly matriculated students of the University of Munich, which was then the second university in Germany, it occurred to me then how unfortunate I had been in not being able to study pharmacy at Columbia, as I had been able to study chemistry, and I thought that in the not far distant future the chemist and the pharmacist would have the great advantage of the entire University training. This advantage is now within our reach.

"I want to point out to you that all the members of the College, that all the students and graduates, the Trustees, the ex-President and the President, and above all, the Faculty of the College, are the ones who are responsible for this move. I may say that

from the very beginning they have striven for the very highest standard of honorable scholarship in pharmacy—they have always striven to raise the standard. The Philadelphia College and the New York College have taken the very first rank in pharmaceutical education in this country, and it is to our credit, for we may say it, and to our honor, that Columbia University has recognized this fact. We can be very sure that no such suggestion, no such invitation, would have come from them if they had not investigated and recognized the quality of instruction and the high standard held by this College."

After pointing out some of the advantages which the students of the College would enjoy as undergraduates of Columbia, the Chairman said: "The negotiations have been rather protracted, because there were a great many minor points to be adjusted. It seemed at first glance that it would not be possible because our standard of admission was not the same as for admission to Columbia, and because the courses and diploma were not the same. But your committee has had many conferences and many meetings. The men whom you must thank for bringing it to a successful close, the ones who have given it the greatest time and advice, are President Chandler, Secretary Main, Treasurer Bigelow and Professor Rusby, of the Faculty. They have been constant in furthering these negotiations and in giving of their time and their experience to help."

Thomas F. Main, Secretary of the College, was then asked to read the agreement proposed, which was as follows:

This Agreement, made the day of , one thousand nine hundred , between

The Trustees of Columbia College in the City of New York, and the College of Pharmacy of the City of New York (hereinafter referred to respectively as "Columbia University," or "the University," and "The College of Pharmacy"), Witnesseth:

For the purpose of securing to the students of the above-named University and College reciprocal advantages and opportunities, and especially for the purpose of including the College of Pharmacy as a professional school for pharmacists and pharmaceutical chemists in the educational system of the University, it is mutually covenanted and agreed:

(1) That the President of the University shall be, *ex officio*, President of the College of Pharmacy. He shall preside at the meetings of the Faculty of the College and shall have general supervision and direction of the educational administration of such College as in the other schools of the University.

(2) That the internal administration of the College of Pharmacy shall be

conducted by a Dean, who shall be appointed by the Trustees of the College of Pharmacy on the nomination of the President of the University.

(3) That the College of Pharmacy shall be represented in the University Council of Columbia University by its Dean. Whenever the College shall maintain ten or more professors in its Faculty, it shall be entitled to a representative in the Council, additional to the Dean, who shall be elected by such Faculty.

(4) That representatives of the University Departments of Botany, Chemistry, Physiological Chemistry and Materia Medica, to be designated by the President of the University, shall be members, *ex officiis*, of the Faculty of the College of Pharmacy. Such representatives of University departments shall have no right to vote for the representative of the Faculty of the College of Pharmacy in the University Council.

(5) That the University will confer such degrees and diplomas upon students and graduates of the College of Pharmacy as may from time to time be authorized by the Trustees of the College of Pharmacy and approved by the University Council, provided that so long as this agreement is in force the College of Pharmacy shall grant no degrees or diplomas except such as may be approved by the University Council.

(6) That the College of Pharmacy shall continue to exercise the direction and control of all instruction given therein, and the right to grant such certificates to students not candidates for a degree or diploma as may be determined by the Faculty of the College of Pharmacy with the approval of the University Council; and shall exercise all other corporate rights and powers which are not delegated to the University by this agreement; but this agreement shall not be deemed a surrender by the College of Pharmacy of any powers conferred upon it by charter.

(7) That the College of Pharmacy shall retain its separate corporate organization, and that the Trustees of the College of Pharmacy shall continue to provide for the financial support thereof, it being distinctly understood and agreed that the University is, and shall be, under no implied obligation, responsibility or liability of any kind whatsoever for the maintenance, support, direction or management of the College of Pharmacy or for the disbursement of the income thereof; but that all and every such obligation or liability shall be strictly limited to the duties and obligations hereinbefore expressly and in terms assumed and agreed to by the University.

(8) That the courses of instruction given in either the University or the College of Pharmacy shall be open, subject to the general regulations of each institution, to every qualified student who has duly matriculated in either the University or the College of Pharmacy.

(9) That, for each student of the University pursuing courses in the College of Pharmacy, the University shall pay the College of Pharmacy at a rate to be agreed upon from time to time. For each student of the College of Pharmacy pursuing elective courses in the University, the College shall pay to the University at a rate to be agreed upon from time to time. No payment shall be called for from one to the other on account of students or instructors receiving instruction as Fellows or Scholars, or otherwise without payment of fees for tuition either in the University or the College of Pharmacy.

(10) That the Libraries of the University and of the College of Pharmacy

shall be open, upon equal terms, to all students of the University and of the College.

(11) That the Superintendent of Buildings and Grounds, the Librarian, and the Registrar of the University, or the persons performing the duties now attached to these offices, shall be, respectively, Superintendent of Buildings and Grounds, the Librarian, and the Registrar of the College of Pharmacy.

(12) This agreement shall take effect July 1, 1904.

(13) This agreement may be modified at any time by mutual consent expressed in writing, and may be terminated at the end of any academic year, and after one year's notice in writing, from either party to the other.

Mr. Samuel W. Fairchild, an ex-President of the College, moved the adoption of the report of the committee and of the Board of Trustees, and the ratification of the same, which motion was seconded by Mr. McIntyre.

The chairman then called upon members of the committee to explain certain things in regard to the agreement, and Mr. Bigelow, Treasurer of the College, spoke as follows:

"Mr. Chairman, after listening to the reading of this proposed plan of merger with Columbia University, it must be apparent to every member of this College who has read this agreement or who has listened to the reading of it, that we are in no wise surrendering our College wholly to Columbia University. We are not giving up a great deal. On the other hand, the advantages that will accrue to this College from its union with Columbia are very great. It is now some ten years since the subject was first discussed, but the interest at that time did not seem very great on either side. Columbia was then at its old quarters on Madison Avenue, and aside from the union with the College of Physicians and Surgeons, no other separate teaching institution had been incorporated with it, with the College as it was at that time. Since the University has moved to its new location at 116th Street, it has planned to take in a number of other Colleges. The Teachers College was the first, I believe, then Barnard College, and I think we should feel highly flattered that we are the third institution to be invited to join that great University. At the meeting of our committee with President Butler, of Columbia, he informed us that it was proposed that the University take in a large number of Colleges in this vicinity, on the same basis as the invitation to this College to join Columbia. This College occupies a very unique position as an independent College. It has never had an endowment of any kind, and still is self-sustaining, and for the past five years has had a surplus in its

treasury at the end of each year, and has paid off some of the mortgage on its building. These facts, of course, were known to President Butler when he made overtures to this College to join Columbia, and the curriculum of this College was fully looked into, and it appeared to the faculty and trustees of Columbia that it would be better to invite a College of Pharmacy of the standing of this College to join the University, rather than to set up a separate department for instruction in pharmacy, which it became apparent to the trustees of Columbia in the near future would be necessary. Many of the details in regard to the curriculum have not as yet been worked out, but the business end of the plan has been gone into thoroughly, and the trustees of the College feel assured that it will work well in the future. We do not relinquish supervision of our funds, neither do we relinquish any of our present rights. The Librarian of Columbia will have charge of our library; the Custodian of Buildings of Columbia will have charge of our building, supervision over it, and make certain recommendations in regard to carrying on the work of the College from a business point of view. It is now some five or six months since this plan was presented to the trustees, and so far as I know, and so far as I can learn from other members, not a dissenting voice has been raised against this proposed plan, and we come before you to-night and present it, with the hope that it will receive the unanimous support of every member of the College."

Professor Rusby then spoke on behalf of the Faculty, in favor of the proposed agreement.

Vice-President Schieffelin said: "I want to announce that a few days ago the trustees of the University of Columbia approved this agreement as it is here printed, I believe unanimously."

Mr. Ewen McIntyre, ex-President of the College, spoke as follows: "Gentlemen:—I hardly think it is necessary for me to add anything to what has already been stated here as to the good that will come to us from the proposition now before us. I think that when Dr. Rusby gets to be about my age he will not tell the same story about the old fellows that he tells now; and he will arrive there if he lives long enough. I have seen great changes since I graduated at this College some fifty-seven years ago. I knew every one of the original incorporators of the institution; all passed away, the last one only some three years ago—George N. Lawrence. And what is more

remarkable, I have lived to see the fourth generation of one of our drug houses presiding here at our meeting to-night. (Applause.) It is a remarkable coincidence. It is not many who live to see that sort of thing. It gives me very great pleasure to be here to-night, and I am sure that every one of us will see our way clear to accept this proposition. I had a very warm letter from Dr. Chandler on Saturday requesting that I would make a great effort to be here. He little thought then that I would be here and he would not. That I regret his absence it is not necessary for me to say."

Dr. Elliott also spoke in favor of the proposed agreement, and Mr. Main suggested that a rising vote be taken.

The chair then put the question, and requested all in favor of accepting the proposed agreement between the Trustees of Columbia College, in the city of New York, and the College of Pharmacy, of the city of New York, to signify the fact by rising.

The Secretary counted the vote, and announced seventy-nine in favor of the proposition.

The chair then requested any voting in the negative to rise, and, there being none, announced the vote as unanimous.

The chair then announced the customary recess of five minutes previous to the election of officers.

The following officers were elected: President, Nicholas Murray Butler; First Vice-President, Charles F. Chandler; Second Vice-President, Wm. Jay Schieffelin; Third Vice-President, Herbert D. Robbins; Treasurer, Clarence O. Bigelow; Secretary, Thomas F. Main; Assistant Secretary, O. J. Griffin; Trustees, Messrs. Amend, Goldmann, Knapp, White and Henning.

After the ratification of the agreement of consolidation between the two institutions, the chairman of the Drug Trade Section of the Board of Trade and Transportation said that "the manufacturers and the jobbers of your city are interested in your progress, and stand ready to render what assistance they may in the maintenance and perpetuation of an institution so necessary for the welfare of mankind, and one in which there is centered so much of local pride. I believe this to be a long stride forward in the bettering and raising of the standard of pharmaceutical education."

Mr. Felix Hirseman, on behalf of the German Apothecaries' Society, said: "The retail pharmacists of this city in local associations, and also in conventions in the State of New York for the last

five years, have looked with favor to an advancement in the study of pharmacy, and to-day there is pending in the Legislature of this State a bill providing that education shall be necessary before a student can matriculate in any college of pharmacy in the State of New York. There is little doubt in my mind that that bill will finally become a law, and will demand a higher education to become a matriculant of such a college. I think, ladies and gentlemen, the dawn of a high education in pharmacy is at hand, for which the ambitions of the members of this college have been striving for years."

Among other things, Dr. Wm. C. Alpers said: "We now approach a system where the preliminary requirements of those who wish to enter the College will not be any more a matter of form, but will be strictly enforced. We know under what difficulties all colleges of pharmacy in this country have suffered. We know that pharmacy is not a science of itself, but rather the combination of the study of other sciences, and as these different sciences have made enormous progress during the last two or three decades, we know the leaders in the colleges of pharmacy have been compelled in order to keep pace with the advancement of these sciences, to pile one new study after another on the curriculum, which ten or twenty years ago was even then too difficult for the material that was at our disposal. We know what a vast difference exists between the preliminary requirements of the colleges of pharmacy in this country and similar institutions in Europe. The high requirements there enforced are not the result of despotism or the desire of selfish exclusiveness, for these colleges are just as anxious to get students as we are. But these high requirements are absolutely necessary and were forced upon the leaders of the old universities as the result of experiments for a century."

Charles S. Erb, on behalf of the Alumni Association, said: "In order to show the appreciation of the Alumni Association for this College, they have thought it wise to give some tangible token of their love for the College, and on this seventy-fifth anniversary they donate to the College the sum of $2,000. In this connection I may state that about $500 of this sum has been given by the professors of the College, $500 by the Association itself, and the other thousand has been contributed by several members."

President Nicholas Murray Butler, of Columbia, was not present, having gone to Mexico.

REVIEWS AND BIBLIOGRAPHICAL NOTICES.

FIRST COURSE IN MICROCHEMICAL ANALYSIS. By Carl Gustav Hinrichs. With atlas. St. Louis, Mo., 1904. New York and Leipzig: Lemcke and Buechner.

About a year ago Prof. Gustav D. Hinrichs, the well-known author on atomic weights and general chemistry, requested his son to work out a course in microchemical analysis which should not require the use of sulphuretted hydrogen, intending to use it in connection with a work on microchemical analysis which he had contemplated publishing. Upon the completion of the work by his son, the elder Hinrichs insisted that his son's name appear as author, he writing an introduction to crystallographic chemistry.

Microchemical analysis is defined as the chemical identification of minimal amounts of substance in concentrated solutions. The amount of substance used in such analysis is very small, usually a tenth of a milligramme giving sharp and positive results.

While it is known to a certain extent that the crystalline form of a substance is an extremely important physical property in its identification, yet chemists have not generally confirmed their results by microscopic examinations of chemicals or precipitates. This work by Hinrichs will draw attention again to this important subject.

Considerable work has already been accomplished along this line, there being at least one rather comprehensive German work on the subject. The plates reproduced from the works of Behrens, Haushofer, Lehman, and others, as well as the original drawings of the author, are of considerable assistance in connection with the text. In the present work the author has considered the substances usually considered in a complete course of qualitative analysis.

Another work covering Dr. Hinrichs's researches on complex compounds and mixtures, as well as organic compounds, is in preparation.

The introduction to crystallographic chemistry, by Dr. Gustav D. Hinrichs, is particularly valuable and unusually clear.

We commend the present work for its originality and usefulness, to chemists and pharmacists, and all interested in microchemical analysis.

PHARMACEUTICAL MEETING.

The sixth of the pharmaceutical meetings of the Philadelphia College of Pharmacy of the series for 1903–04 was held on Tuesday, March 15th, at 3 o'clock. Mr. William L. Cliffe, a member of the Board of Trustees, presided.

The first paper on the programme was by Prof. Wilbur L. Scoville, of the Massachusetts College of Pharmacy, on "Aromatic Elixir," which was accompanied by specimens, and was read in the absence of the author by Mr. Warren H. Poley. (See page 158). In discussing the paper, E. M. Boring remarked that he followed the method recommended by Professor Scoville of separating the yellow, oily layer of the rind by paring it off with a shoemaker's knife. The observation that the addition of alcohol either to the orange and lemon peels or to the oils masked the odor, was commented upon by Messrs. Poley, Boring, Cliffe and Remington. Professor Remington said that perfumers had long known that alcohol was a perfect solvent for volatile oils, holding the constituents very closely, and that dissociation was effected upon the addition of water to the alcoholic solution, thus developing the odor. Charles Leedom stated that he preferred to use solutions of good volatile oils.

Professor Remington said that owing to the fact that it was almost impossible to obtain volatile oils of orange and lemon that could be depended upon, it was proposed to introduce into the next Pharmacopœia a process for making spirits of orange and lemon directly from the peel, and that the preparations thus made kept many times better than spirits made from the volatile oils. He furthermore said that he doubted if muscatel wine would be introduced into the Pharmacopœia.

The question was raised by Professor Remington as to how the pharmacists of the country would receive the change proposed by Professor Scoville, and whether they would take the trouble to get oranges and lemons for the preparation of the tinctures.

Mr. Boring said that it would depend upon the individual, that the man who was interested in his profession would use the improved formula. Mr. Poley said it would depend upon whether the formula was an actual improvement, and cited the efficiency of the old formula for syrup of tolu as compared to that which is official at the present time. In regard to this point, Professor Remington said

that the old formulas for both syrup of tolu and syrup of ginger would be restored.

Dr. Carl Frese, L.S.A., of Philadelphia, presented a paper, entitled "A Physician's Experience with Pharmacists." The paper gave rise to an animated discussion, which was participated in by Messrs. Warren H. Poley, E. M. Boring, Wm. McIntyre, C. B. Lowe, Joseph P. Remington, M. I. Wilbert, Wm. A. Lee, John Burg, Charles Leedom and the chairman. Like in all discussions of this kind, it was shown that the better the understanding between physicians and pharmacists the better it is for both professions, and that in both professions there are men who do not live up to the code of ethics of their respective callings. Owing to the importance of this subject, not only in its relation to the two professions, but as it concerns the public at large, it will be further considered at a later meeting.

Mr. McIntyre said he thought that physicians who use the metric system should use the line rather than the point for separating the decimal quantities.

Mr. Wilbert called attention to the difference existing between the practice of pharmacy in hospitals in Philadelphia and the same in the hospitals in Europe, particularly in Paris, where, of the fifty-seven active members of the Paris Society of Pharmacy, twenty-two are hospital pharmacists, and many of them leaders in their profession and well-known scientific men.

Harold B. Morgan, P.D., read a short paper describing a universal percolating stand which he had devised, and exhibited a stand in connection therewith. The stand is capable of an operation requiring any size of percolator up to 3 gallons, and any size of receiver up to a 5-gallon demijohn. Professor Remington said the idea was a good one, providing one had plenty of room. He said there was no disadvantage in the iron ring if sections of rubber tubing are placed at several places on the ring, as originally suggested by Dr. Squibb.

He further remarked that by use of an iron rod, six percolators could be used at a time, and said that with a revolving stand, like a castor or book-case, its usefulness would be increased. Mr. W. C. Wescott said that he used a method suggested to him by Mr. Wilbert and employed by him at the German Hospital, namely, of using iron rods suspended from joists in the ceiling.

M. I. Wilbert, Ph.M., presented some notes from Joseph Ince's book on "Elementary Dispensing" (see page 171).

Wm. McIntyre exhibited a collection of price-lists of forty years ago, and said:

"The object of the committee in having this subject brought to the meeting is largely the historic side, and while I can show some lists of the period, you will find the exhibit contains names of firms still in business, and many others who have been part of the drug, chemical and allied industries of our city.

"With such a large and representative meeting of druggists I will take occasion to distribute some pictures of members of the American Pharmaceutical Association, with a short account of the meeting held at Washington in 1884, my object being to invite all who are not now members, to become such, and meet with them this year at Kansas City and St. Louis.

"To-day I will give a short history of one of the leading chemical concerns—Rosengarten & Sons. My reason for which is, I have been in the business forty years on an uptown street, which in my early life was distinguished by having at one end Carl Zeitler and at the other J. W. Farr, names somehow intertwined with chemical history.

"Much of interest can be developed from reading a few orders, bills and letters. While they show that but little was spent with the printer, they contain names of strong men who have left with us results of their energy.

"In 1824 bottles were bought at T. W. Dyatt's factory, Aramingo Creek and Delaware River. 1834, Al. E. Roberts sold quicksilver at 56 cents, and saltpetre at 9½ cents. 1836, Lennig & Co. sold opium at $4.12½. 1837, John Henshaw bartered 100 pounds of opium at $4.25 for morphine at $4.50 per ounce; the letters show that 'bark' came by sloop from Baltimore. A sale made to W. L. Krumbhaar of sulphate and acetate of morphine in drachm bottles—put up in French style—illustrates, even at that day, some of the difficulties of introducing American-made goods under correct labels.

"In closing, I call attention to a series of price-lists illustrating the growth of the firm of Keasby & Mattison. With this many of us are familiar, even some having been students under Dr. Mattison's care. Both members of this firm are graduates of this College, and, no doubt the chemistry learned here was the corner-stone of their success. To illustrate what I have in my mind, carbonate of mag-

nesia is soluble in carbonic acid water and insoluble in water. How much has the utilization of these facts to do with the extensive chemical plant at Ambler?"

Professor Kraemer called attention to the following specimens: Three sets of cocoa in its various stages from the bean to the powder, showing the shells, cocoa butter, etc., which were received from the Croft & Allen Company, of this city, and which he intended to distribute in the several departments of the College; samples of thirteen crude drugs which were grown by the U. S. Department of Agriculture, in connection with drug-plant investigations.

Thos. S. Wiegand exhibited a portable assay balance in a metal case—intended especially for the use of assayers when traveling through the mining regions—made by Henry Troemner. The entire case with contents weighs but 19½ ounces; measures 7 inches in height, 4¾ inches in breadth and 2 inches in depth. It is sensitive to the $\frac{1}{50}$ of a milligramme. The case is provided with set screws, so as to make it set level. The firm have just received an order from the Chinese Mint for a bullion balance capable of weighing 10,000 ounces of silver at a draft, and is to be sensitive to $\frac{1}{100}$ of an ounce when carrying the load of 20,000 ounces. They also received an order for eighteen adjusting balances for the same establishment.

A vote of thanks was tendered the several speakers and those who sent specimens.

The following provisional programme has been arranged for the next meeting, on April 19th:

"A Pharmacist's Impression of the Orient," by E. Ross.

"Notes on Italian Olive Oil," by A. Angusto.

"The Manufacture and Commerce of Honey," by Wm. A. Selzer.

"The Pharmacist and the Pharmacopœia," by M. I. Wilbert.

"A New Prescription File," by John W. Outerbridge.

HENRY KRAEMER, *Secretary.*

PHARMACEUTICAL SOCIETY OF GREAT BRITAIN.—The report of the Registrar of the Society, for 1903 (*Pharmaceutical Journal*, February 6, 1904), contains some figures which are of more than local interest. The total strength of the Society is stated to be as follows: Life compounders, 459; annual subscribers, composed of members and student-associates, 6,188. The number of persons registered as "apprentices or students" is 194. The number of pharmaceutical chemists on the register is 2,141, and of chemists and druggists, 13,436. Four hundred and nine cases of alleged infringement of the Pharmacy Act (1868) were investigated during the year, and proceedings instituted in 151 of these.